

1 CLAIMS

2 We claim:

- 3 *sub 7*
- 4 1. A method for digitally processing transform data  
5 representing a phenomenon, the method comprising:  
6 performing an inverse transform of said transform data  
7 to the real domain forming high-precision numbers;  
8 and  
9 manipulating said high-precision numbers to produce an  
10 effect.
- 11 2. A method as recited in claim 1, further comprising  
12 converting said high-precision numbers to integers and  
13 clipping the integers to an allowed range forming  
14 converted data.
- 15 3. A method as recited in claim 1, wherein the phenomenon is  
16 an image.
- 17 4. A method as recited in claim 1, wherein said effect is  
18 the chroma-key merging of two data sets.
- 19 5. A method as recited in claim 1, wherein said effect is  
20 the color correction of image data.
- 21 6. A method as recited in claim 3, wherein said effect is a  
22 90 degree rotation of the image.
- 23 7. A method as recited in claim 1, wherein said  
high-precision numbers are floating point numbers.

- 1 8. A method as recited in claim 1, wherein said  
2 high-precision numbers are fixed precision numbers  
3 including a fractional part.
- 4 9. A method as recited in claim 1, wherein the step of  
5 performing employs an inverse discrete cosine  
6 transform.
- 7 10. A method as recited in claim 1, wherein the step of  
8 performing employs an inverse discrete wavelet  
9 transform.
- 10 11. A method as recited in claim 1, wherein the step of  
11 performing employs an inverse discrete Fourier  
12 transform.
- 13 12. A method for digitally processing transform data in the  
14 real domain representing a phenomenon, the method  
15 comprising:  
16 performing an inverse transform of said transform data  
17 to the real domain forming high-precision numbers;  
18 and  
19 performing a forward transform of said high-precision  
20 numbers.
- 21 13. A method as recited in claim 12, wherein the inverse to  
22 said forward transform is different from said inverse  
23 transform.
- 24 14. A method as recited in claim 13, wherein said forward  
25 transform is a forward discrete cosine transform and  
26 said inverse transform is an inverse discrete wavelet  
27 transform.

- 1 15. A method as recited in claim 1, further comprising  
2 implementing an inverse quantization of transform-coded  
3 data forming the transform data.
- 4 16. A method as recited in claim 15, further comprising  
5 converting said high-precision numbers to integers and  
6 clipping the integers to an allowed range forming  
7 converted data.
- 8 17. A method as recited in claim 15, further comprising  
9 entropy decoding coded data to form the transform-coded  
10 data
- 11 18. A method as recited in claim 17, wherein said coded data  
12 are coded image data.
- 13 19. A method as recited in claim 17, wherein said coded data  
14 are coded video data.
- 15 20. A method as recited in claim 18, wherein said coded  
16 image data are in a JPEG still image international  
17 standard format.
- 18 21. A method as recited in claim 19, wherein said coded  
19 video data are in a MPEG motion video international  
20 standard format.
- 21 22. A method as recited in claim 15, wherein the step of  
22 performing employs an inverse discrete cosine  
23 transform.
- 24 23. A method as recited in claim 15, wherein the step of  
25 performing employs an inverse discrete wavelet  
26 transform.

1 24. A method as recited in claim 15, wherein the step of  
2 performing employs an inverse discrete Fourier  
3 transform.

4 25. A method as recited in claim 15, wherein said  
5 high-precision numbers are fixed precision numbers that  
6 include a fractional part.

7 26. A method as recited in claim 12, further comprising  
8 manipulating said high-precision numbers to produce an  
9 effect.

10 27. A method for digitally processing transform-coded data  
11 representing a phenomenon, the method comprising:  
12 performing an inverse quantization of the  
13 transform-coded data forming transform data;  
14 performing an inverse transform of said transform data  
15 to the real domain forming high-precision numbers;  
16 performing a forward transform of said high-precision  
17 numbers forming forward transformed data; and  
18 performing a quantization of said forward transformed  
19 data forming quantized data.

20 28. A method as recited in claim 27, further comprising:  
21 entropy decoding coded data forming transform-coded  
22 data employing entropy decode; and  
23 entropy encoding the quantized data employing entropy  
24 encode forming encoded data.

25 29. A method as recited in claim 27, further comprising  
26 manipulating said high-precision numbers to produce an  
27 effect.

- 1 30. A method as recited in claim 27, further comprising  
2 converting said high-precision numbers to integers and  
3 clipping to an allowed range forming converted data.
- 4 31. A method as recited in claim 29, further comprising  
5 alternating manipulating steps with the steps of  
6 performing a forward transform, performing a  
7 quantization, entropy encoding, entropy decoding,  
8 performing an inverse quantization, and performing an  
9 inverse transform a desired number of times.
- 10 32. A method as recited in claim 31, wherein said coded data  
11 are compressed data, and each step of alternating  
12 implements a compression/decompression cycle.
- 13 33. A system employing the method recited in claim 31,  
14 wherein each step of alternating recompresses and  
15 decompresses coded data to enable an editing operation.
- 16 34. A method as recited in claim 28, wherein said coded data  
17 are coded audio data.
- 18 35. A method as recited in claim 28, wherein said coded data  
19 are coded electromagnetic environment data.
- 20 36. A method as recited in claim 28, wherein said coded data  
21 are coded video data.
- 22 37. A method as recited in claim 28, wherein said coded data  
23 is encoded in the JPEG standard format.
- 24 38. A system for digitally processing first level  
25 transform-coded data in the real domain representing a  
26 phenomenon, the system comprising:

- 1 a first inverse quantizer to generate transform data  
2 from said transform-coded data;
- 3 a first inverse transformer to produce an inverse  
4 transform of said transform data to the real  
5 domain forming high-precision numbers;
- 6 a first forward transformer for forward transforming  
7 said high-precision numbers forming forward  
8 transformed data; and
- 9 a first quantizer for quantizing said forward  
10 transformed data to form quantized data.
- 11 39. A system as recited in claim 38, wherein the forward  
12 transformer employs a different transform type than a  
13 first transform type employed by the inverse  
14 transformer.
- 15 40. A system as recited in claim 38, wherein said forward  
16 transformer produces a forward discrete cosine  
17 transform and said inverse transformer produces an  
18 inverse discrete wavelet transform.
- 19 41. A system as recited in claim 38, further comprising:  
20 a manipulator for manipulating the high-precision  
21 numbers to produce an effect.
- 22 42. A system as recited in claim 38, wherein said inverse  
23 quantizer and said quantizer use identical quantization  
24 values.
- 25 43. A system as recited in claim 41, wherein only a subset  
26 of the quantized transform data produced different  
27 transform-coded data.

1 44. A system as recited in claim 38, wherein said inverse  
2 quantizer and said quantizer use at least one different  
3 quantization value.

4 45. A system as recited in claim 38, further comprising:  
5 an entropy decoder to form the transform-coded data  
6 from coded data; and  
7 an entropy encoder to encode the quantized data.

8 *9/27* 46. A system for digitally processing transform data  
9 representing a phenomenon, the system comprising:  
10 an inverse transformer to perform an inverse transform  
11 of the transform data to the real domain using  
12 high-precision numbers; and  
13 a manipulator to manipulate the high-precision numbers  
14 to produce an effect.

15 47. A system as recited in claim 46, further comprising a  
16 converter to convert said high-precision numbers to  
17 integers, and a clipper to clip the integers to an  
18 allowed range.

19 *9/23* 48. A system for digitally processing transform-coded data  
20 representing a phenomenon, the system comprising:  
21 an inverse quantizer to perform an inverse quantization  
22 of said transform-coded data to form transform  
23 data;  
24 an inverse transformer to perform an inverse transform  
25 of said transform data to the real domain forming  
26 high-precision numbers; and

1 a manipulator for manipulating the high-precision  
2 numbers to produce an effect.

3 49. A system as recited in claim 48, further comprising a  
4 converter to convert said high-precision numbers to  
5 integers, and a clipper to clip the integers to an  
6 allowed range.

7 50. A system for digitally processing transform data in the  
8 real domain representing a phenomenon, the system  
9 comprising:

10 an inverse transformer to produce an inverse transform  
11 of the transform data to the real domain to form  
12 high-precision numbers; and

13 a forward transformer to forward transform the  
14 high-precision numbers.

15 51. A system as recited in claim 50, further comprising:

16 a manipulator to manipulate the high-precision numbers  
17 to produce an effect.

18 52. A system as recited in claim 41, wherein the quantized  
19 data forms an other level of transform-coded data and  
20 further comprising:

21 another inverse quantizer, another inverse transformer,  
22 another manipulator, another forward transformer,  
23 and another quantizer to perform together a  
24 similar function on the other level of  
25 transform-coded data as performed on the first  
26 level transform-coded data.



- 1 53. A system as recited in claim 52, wherein the effect  
2 produced by the first manipulator is a different type  
3 of effect from that produced by the other manipulator.
- 4 54. A system as recited in claim 52, wherein the functions  
5 of the first inverse quantizer, first inverse  
6 transformer, first forward transformer, and first  
7 quantizer, and the respective functions of said another  
8 inverse quantizer, another inverse transformer, another  
9 forward transformer, and another quantizer are each  
10 performed by a same module.
- 11 55. A method as recited in claim 2, further comprising  
12 providing said converted data for use by an output  
13 device.
- 14 56. A method as recited in claim 55, wherein the output  
15 device is a display monitor.
- 16 57. A method as recited in claim 55, wherein the output  
17 device is a raster display monitor.
- 18 58. A method as recited in claim 1, wherein the transform  
19 data includes information of a spectral analysis.
- 20 59. An article of manufacture comprising a computer usable  
21 medium having computer readable program code means  
22 embodied therein for digitally processing transform  
23 data representing a phenomenon, the computer readable  
24 program code means in said article of manufacture  
25 comprising computer readable program code means for  
26 causing a computer to effect:

performing an inverse transform of said transform data  
to the real domain forming high-precision numbers;  
and  
manipulating said high-precision numbers to produce an  
effect.

60. An article of manufacture as recited in claim 59, the  
computer readable program code means in said article of  
manufacture further comprising computer readable  
program code means for causing a computer to effect  
converting said high-precision numbers to integers and  
clipping the integers to an allowed range forming  
converted data.

61. An article of manufacture as recited in claim 59,  
wherein the phenomenon is an image.

62. A computer program product comprising a computer usable  
medium having computer readable program code means  
embodied therein for digitally processing transform  
data in the real domain representing a phenomenon, the  
computer readable program code means in said computer  
program product comprising computer readable program  
code means for causing a computer to effect:

performing an inverse transform of said transform data  
to the real domain forming high-precision numbers;  
and  
performing a forward transform of said high-precision  
numbers.

1 63. A computer program product as recited in claim 62,  
2 wherein the inverse to said forward transform is  
3 different from said inverse transform.

4 64. A computer program product as recited in claim 62,  
5 wherein said forward transform is a forward discrete  
6 cosine transform and said inverse transform is an  
7 inverse discrete wavelet transform.

8 *8/10/59* 65. A program storage device readable by machine, tangibly  
9 embodying a program of instructions executable by the  
10 machine to perform method steps for digitally  
11 processing transform-coded data representing a  
12 phenomenon, said method steps comprising:  
13 performing an inverse quantization of said  
14 transform-coded data forming transform data;  
15 performing an inverse transform of said transform data  
16 to the real domain forming high-precision numbers;  
17 and  
18 manipulating said high-precision numbers to produce an  
19 effect.

20 66. A computer program product as recited in claim 65, the  
21 computer readable program code means in said computer  
22 program product further comprising converting said  
23 high-precision numbers to integers and clipping the  
24 integers to an allowed range forming converted data.

25 67. A program storage device readable by machine, tangibly  
26 embodying a program of instructions executable by the  
27 machine to perform method steps for digitally

- 1 processing transform-coded data representing a  
2 phenomenon, said method steps comprising:  
3 performing an inverse quantization of the  
4 transform-coded data forming transform data;  
5 performing an inverse transform of said transform data  
6 to the real domain forming high-precision numbers;  
7 performing a forward transform of said high-precision  
8 numbers forming forward transform data; and  
9 performing a quantization of said forward transformed  
10 data forming quantized data.
- 11 68. A program storage device readable by machine as recited  
12 in claim 67, said method steps further comprising  
13 manipulating said high-precision numbers to produce an  
14 effect.
- 15 69. A program storage device readable by machine as recited  
16 in claim 67, said method steps further comprising  
17 converting said high-precision numbers to integers and  
18 clipping to an allowed range forming converted data.
- 19 70. A program storage device readable by machine as recited  
20 in claim 67, said method steps further comprising:  
21 entropy decoding coded data forming transform-coded  
22 data employing entropy decode; and  
23 entropy encoding the quantized data employing lossless  
24 entropy encode forming encoded data.
- 25 71. A program storage device readable by machine as recited  
26 in claim 70, said method steps further comprising  
27 alternating said manipulating steps with said steps of

1 performing a forward transform, performing a  
2 quantization, entropy encoding, entropy decoding,  
3 performing an inverse quantization, and performing an  
4 inverse transform a desired number of times.

5 72. A program storage device readable by machine as recited  
6 in claim 71, wherein said coded data are compressed  
7 data, and each step of alternating implements a  
8 compression/decompression cycle.

9 73. A program storage device readable by machine as recited  
10 in claim 70, wherein the phenomenon is image data  
11 encoded in the JPEG standard format.

12 74. A method for digitally processing transform data in the  
13 real domain representing a phenomenon, the method  
14 comprising:

15 performing an inverse transform of said transform data  
16 to the real domain forming high-precision numbers;  
17 converting the high-precision numbers to integers which  
18 include out of range data; and  
19 performing a forward transform of the integers forming  
20 forward transformed data.

21 75. A method as recited in claim 74, further comprising  
22 manipulating the integers to produce an effect.

23 76. A method as recited in claim 74, further comprising:

24 performing an inverse quantization of transform-coded  
25 data to form the transform data; and

26 performing a quantization of said forward transformed  
27 data forming quantized data.

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1 77. A method as recited in claim 74, further comprising  
2 clipping the integers to an allowed range forming  
3 converted data.

4 78. A method as recited in claim 76, further comprising  
5 alternating manipulating steps with the steps of  
6 performing a forward transform, performing a  
7 quantization, performing an inverse quantization, and  
8 performing an inverse transform a desired number of  
9 times.

10 79. A program storage device readable by machine, tangibly  
11 embodying a program of instructions executable by the  
12 machine to perform method steps for digitally  
13 processing transform data in the real domain  
14 representing a phenomenon, said method steps  
15 comprising:  
16 performing an inverse transform of said transform data  
17 to the real domain forming high-precision numbers;  
18 converting the high-precision numbers to integers which  
19 include out of range data; and  
20 performing a forward transform of the integers forming  
21 forward transformed data.

22 80. A program storage device readable by machine, as recited  
23 in claim 79, further comprising manipulating the  
24 integers to produce an effect.

25 81. A program storage device readable by machine, as recited  
26 in claim 79, further comprising performing an inverse  
27 quantization of transform-coded data to form the  
28 transform data.

1 82. A program storage device readable by machine, as recited  
2 in claim 79, further comprising performing a  
3 quantization of said forward transformed data forming  
4 quantized data.

5 83. A program storage device readable by machine, as recited  
6 in claim 79, further comprising clipping the integers  
7 to an allowed range forming converted data.

8 84. A method as recited in claim 17, wherein said coded data  
9 are coded audio data.

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